PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1995; Rev. A) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 90	(1995) Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM A 153	(1995) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 167	(1994; Rev. A) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 615	(1995; Rev. C) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 616	(1996) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM B 370	(1992) Copper Sheet and Strip for Building Construction
ASTM C 67	(1994) Sampling and Testing Brick and Structural Clay Tile
ASTM C 91	(1995; Rev. B) Masonry Cement
ASTM C 94	(1995) Ready-Mixed Concrete
ASTM C 129	(1995) Nonloadbearing Concrete Masonry Units
ASTM C 144	(1993) Aggregate for Masonry Mortar
ASTM C 150	(1995) Portland Cement
ASTM C 207	(1991; R 1992) Hydrated Lime for Masonry Purposes
ASTM C 216	(1995; Rev. B) Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 270	(1995; Rev. A) Mortar for Unit Masonry
ASTM C 780	(1994) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 1019	(1989; Rev. A, R 1993) Sampling and Testing Grout

ASTM C 1072	(1994) Masonry Flexural Bond Strength
ASTM C 1142	(1995) Extended Life Mortar for Unit Masonry
ASTM D 1330	(1985; R 1995) Rubber Sheet Gaskets
ASTM E 447	(1992; Rev. B) Compressive Strength of Masonry Prisms
ASTM E 514	(1990) Water Penetration and Leakage Through Masonry

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO UBC	(1997) Uniform Building Code

1.2 SUBMITTALS

Submit the following in accordance with section 01330 "Submittal Procedures."

1.2.1 SD-03, Product Data

a. Masonry accessories (veneer anchors)

b. Control joints

c. Water-repellant admixture

Submit for each type.

1.2.2 SD-04, Samples

a. Facing brick

b. Mortar color

Submit two sets of each type masonry units, showing full range of color, texture, finish, and dimensions and two samples of each color of mortar.

1.2.3 SD-06, Test Reports

a. Mortar strength and properties

1.3 QUALITY ASSURANCE

1.3.1 Appearance

Do not change source or supply of materials after work has started if the appearance of the finished work would be affected.

1.3.2 Testing

Masonry strength shall be determined in accordance with ACI 530.1 and the cost of testing shall be paid by the Contractor.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver cementitious materials to the site in unbroken containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious materials in dry, weathertight sheds or enclosures and handle so as to prevent entry of foreign materials and damage by water or dampness. Store masonry units off the ground and handle with care to avoid chipping and breakage. Protect materials from damage and, except for sand, keep dry until used. Cover sand to prevent intrusion of water and foreign materials and to prevent drying. Do not use materials containing frost or ice. Store Type II, concrete masonry units at the site for a minimum of 28 days for air cured units, 10 days for atmospheric steam or water cured units, and 3 days for units cured with steam at a pressure of 120 to 150 psi and at a temperature of 350 to 365 degrees F for at least 5 hours. Protect moisture controlled units (Type I) from rain and ground water.

1.5 ENVIRONMENTAL CONDITIONS

1.5.1 Hot Weather Construction

ACI 530.1.

1.5.2 Cold Weather Construction

ACI 530.1.

1.6 SCHEDULING

Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching.

1.7 BRACING

Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

2.1.1 Facing Brick

ASTM C 216, Grade SW, Type FBS, 4 inches thick, 2 2/3 inches high, and 8 inches long nominal. Color, texture, and range of facing brick shall match the brick on other FLETC facilities. Brick shall be of uniform light buff color with a wire cut texture as manufactured by Acme Brick.

2.1.2 Concrete Masonry Units

Units of modular dimensions and air, water, or steam cured. Surfaces of units which are to be plastered or stuccoed shall be sufficiently rough to provide bond. Exterior concrete masonry units shall have water-repellant admixture added during manufacture.

a. Hollow Load-Bearing Units: ASTM C 90, Type I made with medium weight aggregate. Provide load-bearing units for exterior walls and foundation walls.

b. Special Shapes: Provide special shapes such as closures, header units, and jamb units as necessary to complete the work. Special shapes shall conform to the requirements for the units with which they are used.

2.1.3 Water-Repellant Admixture

Polymeric type formulated to reduce porosity and water transmission. Construct panels of masonry units conforming to ASTM C 744 and mortar which contain the water-repellant admixture. When tested in accordance with ASTM C 1072, such panels shall have flexural strength not less than that specified or indicated. When tested in accordance with ASTM E 514, panels shall exhibit no water visible on back of test panel and no leaks through the panel after 24 hours, and not more than 25 percent of wall area shall be damp after 72 hours.

2.2 MORTAR

2.2.1 Mortar Properties

ASTM C 270 Type S for remaining masonry work. Air content shall not be less than 11 percent for freeze thaw durability. Where colored mortar is indicated, add pigment to obtain the mortar color indicated. The quantity of metallic oxide pigment relative to the cementitious content of the mortar mix shall be no more than 10 percent by weight. Carbon black shall be no more than 2 percent by weight. Compressive strength shall equal 1800 psi.

2.2.1.1 Portland Cement

ASTM C 150, Type I, Cement in mortar for exterior brickwork shall be white.

2.2.1.2 Hydrated Lime

ASTM C 207, Type S. Hydrated lime in mortar for exterior brickwork shall be white.

2.2.1.3 Masonry Cement

ASTM C 91, Type S. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar.

2.2.1.4 Sand

ASTM C 144. Sand in combination with cementitious materials shall produce a mortar of the specified color.

2.2.1.5 Water

Clean, potable, and free from substances which could adversely affect the mortar.

2.3 GROUT

ASTM C 476 coarse. Slump between 8 and 11 inches. Provide minimum grout strength of 2000 psi in 28 days, as tested by ASTM C 1019.

2.3.1 Admixtures

Do not use air-entrainment, anti-freeze or chloride admixtures.

2.3.2 Ready Mixed Grout

ASTM C 94.

2.4 MASONRY ACCESSORIES

2.4.1 Anchors and Wall Ties

Provide approved designs of stainless steel, ASTM A 167, Type 304, zinc-coated steel, or noncorrosive metal having the equivalent total strength of steel types. Zinc coat steel by the hot-dip process after fabrication to a minimum of 1.25 ounces of zinc per square foot of surface when tested in accordance with ASTM A 90.

a. Steel eyelet anchors with wire ties: Steel eyelet anchor shall be self-drilling fastener with 5/8 inch barrel for 5/8 inch gypsum board anchored directly to steel stud. Wire tie shall be not lighter than 6 gage and provide vertical adjustment.

2.4.2 Fastenings

Build in bolts, metal wall plugs, and other metal fastenings furnished under other sections for securing furring and other items.

2.4.3 Through-Wall Flashing

Provide one of the following types except that flashing indicated to terminate in reglets shall be metal or coated-metal flashing and except that the material shall be one which is not adversely affected by dampproofing material.

a. Reinforced Membrane Flashing: Polyester film core with a reinforcing fiberglass scrim bonded to one side. The membrane shall be impervious to moisture, flexible, and not affected by caustic alkalis. The material, after being exposed for not less than 1/2 hour to a temperature of 32 degrees F, shall show no cracking

when, at that temperature, it is bent 180 degrees over a 1/16 inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction 360 degrees.

2.4.4 Weep Holes

Prefabricated aluminum or plastic sized to form the proper size opening in head joints. Provide aluminum and plastic inserts with grill or screen-type openings designed to allow the passage of moisture from cavities and to prevent the entrance or insects.

2.4.5 Synthetic Rubber Washers

Rubber washers shall be provided between veneer anchors and the gypsum sheathing and the moisture barrier on the outside face and conform to ASTM D 1330, Grade 1.

2.4.6 Sealant

Sealant as specified in Section 07920, "Joint Sealants."

2.4.7 Fiberglass-Faced Gypsum Sheathing

Fiberglass-faced gypsum sheathing shall be as specified in Section 09250, "Gypsum Board."

PART 3 - EXECUTION

3.1 PREPARATION

Prior to start of work, masonry inspector shall verify the applicable conditions as set forth in ACI 530.1, inspection. The QC Manager will serve as inspector.

3.1.1 Protection

a. Stains: Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

b. Loads: Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed.

c. Provide temporary bracing as required.

3.1.2 Surface Preparation

Surfaces on which masonry is to be placed shall be smooth, clean, and free of foreign substances when mortar is applied.

3.2 FIELD QUALITY CONTROL

3.2.1 Mortar Strength and Properties

ASTM C 780, for the first 3 consecutive days, and each third day thereafter.

3.2.2 Grout Strength

ASTM C 1019, for the first 3 consecutive days, and each third day thereafter, or each batch of ready mixed grout.

3.3 WORKMANSHIP

Carry masonry up level and plumb. Furnish and use story poles or gage rods throughout the work. Changes in coursing or bonding after the work is started will not be permitted. Do not carry one section of the walls up in advance of the others. Step back unfinished work for joining with new work. Toothing will not be permitted. Check heights of masonry at each floor and at sills and heads of openings to maintain the level of the walls. Build in door and window frames, louvered openings, anchors, pipes, ducts, and conduits as the masonry work progresses. Fill spaces around metal door frames solidly with mortar. Handle masonry units with care to avoid chipping, cracking, and spalling of faces and edges. Drilling, cutting, fitting, and patching to accommodate the work of others shall be performed by masonry mechanics. Cut masonry with masonry saws for exposed work. Structural steelwork, bolts, anchors, inserts, plugs, ties, lintels, and miscellaneous metalwork specified elsewhere shall be placed in position as the work progresses. Provide chases of approved dimensions for pipes and other purposes where indicated and where necessary. Cover tops of exposed walls and partitions not being worked on with a waterproof membrane secured in place and extended down at least 2 feet on both sides. Inspect scaffolding regularly to ensure that it is amply strong, well braced, and securely tied in position. Do not overload scaffolding.

3.4 MORTAR MIXING

Measure mortar materials in 1 cu. ft. containers to maintain control and accuracy of proportions. Do not measure materials with shovels. Mix mortar in a mechanical batch mixer for not less than 3 nor more than 5 minutes after all ingredients are in so as to produce a uniform mixture. Add water gradually as required to produce a workable consistency. Do not load mixer beyond its rated capacity. Keep mortar boxes, pans, and mixer drums clean and free of debris and dried mortar. Retemper mortar which has stiffened because of evaporation by adding water and mixing to obtain a workable consistency. Do not use or retemper mortar which has not been placed in final position within 2 1/2 hours after the initial mixing. Do not use antifreeze compounds, salts, or other substances to lower the freezing point of mortar.

a. Mortar: Mix mortar in accordance with ASTM C 270 to obtain type mortar required. Where colored mortars are required, pigments may be added at the site. When masonry cement is provided, conform to masonry cement manufacturer's printed mixing instructions. During mixing, add water-repellant admixture in quantity recommended by the admixture manufacturer to mortar which will be used in exterior concrete masonry unit walls.

3.5 MORTAR JOINTS

Uniform thickness of 3/8 inch unless otherwise indicated. Tool exposed joints slightly concave with a round or other suitable jointer when the mortar is thumbprint hard. For horizontal joints, jointers shall be at least 12 inches long for brickwork. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Strike flush joints that will not be exposed. Tool vertical joints first. Brush joints to remove all loose and excess mortar. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of plus or minus 1/2 inch in 40 feet.

3.6 TOLERANCES

Masonry work shall be within the following limits:

a. Face of Brick: 1/32 inch from face of adjacent brick.

b. Face of Concrete Masonry Unit: 1/16 inch from face of adjacent unit.

c. Variation From True Plane: 1/4 inch in 10 feet and 1/2 inch maximum in 20 feet or more.

d. Variation From Plumb: 1/4 inch in each story, noncumulative and 1/2 inch maximum in two stories or more.

e. Variation From Level: 1/8 inch in 3 feet, 1/4 inch in 10 feet, and 1/2 inch maximum.

f. Variation in Wall Thickness: Plus or minus 1/4 inch.

3.7 BRICKWORK

Provide brickwork that conforms to requirements of paragraph entitled "Tolerances" of this section. Select and place brick so that better face of stretchers and headers is exposed.

3.7.1 Testing

Except during cold weather, as defined under paragraph entitled "Environmental Conditions," test clay or shale brick daily on the job, prior to laying, as follows: Using a wax pencil, draw a circle the size of a quarter on five randomly selected bricks. Apply 20 drops of water with a medicine dropper to the surface within the circle on each brick. If the average time that the water is completely absorbed in the five bricks is less than 1-1/2 minutes, wet bricks represented by the five bricks tested. Ensure that each brick is nearly saturated, but surface dry when laid. During cold weather, keep masonry units dry until laid.

3.7.2 Application

Unless indicated or specified otherwise, lay brick in running bond. Completely fill joints between bricks with mortar. Form bed joints of a thick layer of mortar slightly furrowed or battered; bevel or pyramid the bed mortar. Form head joints by applying a full coat of mortar on the brick to be laid. Slushing of head joints will not be permitted. Lay closure bricks with mortar on each bedding surface of unit to be laid and units in place. Place brick carefully without disturbing brick previously laid. Dry or butt joints will not be permitted.

3.7.3 Brick-Faced Walls

Brick-Faced Walls: Bond brick in the pattern as indicated on the drawings. Provide additional bonding ties spaced not more than 3 feet apart around the perimeter of and within 12 inches of all openings.

a. Collar Joints: Fill collar joints solid with mortar as each course of brick is laid. Do not disturb units in place.

b. Brick Sills: Lay brick on edge, slope, and project not less than 1/2 inch beyond the face of the wall to form a wash and drip. Fill all joints solidly with mortar and tool.

3.7.4 Brick Veneer

Provide a continuous cavity as indicated. Install brick veneer after sheathing, masonry anchors, and flashing have been installed to the cold-formed steel framing system. Care shall be provided to avoid damaging the moisture barrier. Damaged moisture barrier and flashing shall be repaired or replaced before brick veneer is installed. Means shall be provided to keep cavities clean and clear of mortar droppings.

3.8 CONCRETE MASONRY UNIT WORK

Lay the first course in a full bed of mortar for the full width of the unit. Lay succeeding courses in running bond unless otherwise indicated. Form bed-joints by applying mortar to entire top surfaces of inner and outer face shells. Form head joints by applying mortar for a width of about one inch to ends of adjoining units. Mortar shall be of such thickness that it will be forced out of the joints as the units are placed in position. Where anchors, bolts, and ties occur within the cells of the units, place metal lath in the joint at the bottom of such cells and fill cells with mortar or grout as work progresses. Provide concrete brick for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere as required. Do not dampen concrete masonry units before or during laying.

3.8.1 Reinforced Concrete Masonry Unit Walls

Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Embed the adjacent webs in mortar to prevent leakage of grout. Remove mortar fins protruding from joints before placing grout. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated before placing grout. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than 1/2 inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

3.9 GROUTING

3.9.1 Preparation

Ensure that spaces to be grouted are free of mortar droppings, debris, loose aggregates and any material deleterious to masonry grout. Reinforcement and ties shall be in place before grouting.

3.9.2 Cleanouts

a. When grout pour exceeds 5 feet in height, provide cleanouts in bottom course of masonry in each grout pour.

b. Provide 3 inch minimum cleanout openings.

c. After cleaning, close cleanout openings and brace to resist grout pressure.

3.9.3 Placing Time

Place grout within 1-1/2 hours of introducing water to mixture. Sample and test grout, ASTM C 1019, for each 5,000 square feet of wall.

3.9.4 Pour Height

ACI 530.1.

3.9.5 Lift Height

Place grout in lifts not exceeding 5 feet. For 8 inch block wall, maximum lift is 2 feet.

3.9.6 Consolidation

Consolidate grout at time of placement.

a. Consolidate grout pours 12 inches or less in height by mechanical vibration or by puddling.

b. Consolidate pours exceeding 12 inches in height by mechanical vibration. Reconsolidate by mechanical vibration after initial water loss and settlement have occurred.

3.10 BONDING AND ANCHORING

Unless indicated otherwise, extend partitions from the floor to the bottom of the construction above. Structurally bond or anchor walls and partitions to each other. Securely anchor non-load-bearing partitions and interior walls to the construction above in a manner that provides lateral stability while permitting unrestricted deflection of construction above. Completely embed anchors in mortar joints.

a. Intersections of Non-Load-Bearing Partitions With Other Walls or Partitions: Tie with wire mesh ties at vertical intervals of not more than 2 feet or with masonry bonding in alternate courses.

b. Brick Veneer on cold formed steel framing. Provide steel eyelet anchors with wire ties anchored at 16 inches o.c. both ways.

3.11 THROUGH-WALL FLASHING

Unless indicated otherwise, extend flashing from a point 1/4 inch outside of exterior face of walls, upward in collar joint across wall cavity not less than 6 inches and into reglets mortar of bed joint for backing wythe. Bend down exterior edge to form a drip. Flashing shall be terminated 3/4 inch back from interior face of walls and turned back on itself not less than 1/2 inch. Secure flashing in reglets to ensure a permanent watertight joint as indicated. Provide flashing in lengths as long as practicable. Lap ends not less than 1 1/2 inches for interlocking type and 4 inches for other types. Seal laps as necessary to ensure watertight construction. Provide dams at ends of flashing where masonry abuts concrete and where flashing ends within the masonry.

3.12 WEEP HOLES

Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior. Weep holes shall be open head joints 24 inches o.c., clear round holes not less than 1/4 inch in diameter and 24 inches o.c.

3.13 EXPANSION JOINTS

Provide where indicated in brick walls. Fill joints with a permanently flexible preformed filler material and a sealant as specified in Section 07920, "Joint Sealants."

3.14 FORMS AND SHORING

Construct to the shape, lines, and dimensions of members indicated. Prevent deflections which may result in cracking or other damage to supported masonry. Do not remove until members have cured.

3.15 CLEANING

3.15.1 Protection

During cleaning operations, protect work which may be damaged, stained, or discolored.

3.15.2 Pointing

Upon completion of masonry work and before cleaning, cut out defective mortar joints and tuck point joints and all holes solidly with prehydrated mortar.

3.15.3 Cleaning

Clean exposed masonry surfaces with clear water and stiff fiber brushes and rinse with clear water. Where stains, mortar, or other soil remain, continue scrubbing with warm water and detergent. Where soil still remains on brickwork, continue cleaning as follows: Clean light-colored brickwork surfaces with non-acid or buffered-acid cleaners as recommended by the brick manufacturer. Use cleaners in accordance with the instructions and recommendations of the brick and cleaner manufacturers. Immediately after cleaning each area, rinse thoroughly with clear water. Do not use caustic solutions or sandblasting to clean surfaces. Masonry shall be free of stains, efflorescence, mortar or grout droppings, and debris. Restore damaged, stained, and discolored work to original condition or provide new work.

END OF SECTION